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(54) Pliers or nippers with compound pivot axes.

(57) By providing a pair of pivotally interconnected arm members which are pivotally engaged with a pair of pivotally interconnected jaw members, a uniquely constructed highly efficient cutting pliers or nippers are attained wherein force compounding is realized and reduced input forces are able to achieve substantially greater force levels at the jaws. In the preferred embodiment, the jaw members are maintained in juxtaposed spaced aligned relationship by an elongated bar or fixing plate, thereby preventing unwanted twisting or turning of the jaw members and assuring continuous trouble-free operation. In addition, the pliers or nippers of this invention also preferably incorporates a removable protective cover which peripherally surrounds and protects the plurality of pivot axes from external contamination while also providing the user with safety protection from unwanted pinching or cutting of the user's fingers in the pivot axis area.

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PLIERS OR NIPPERS WITH COMPOUND PIVOT AXES

TECHNICAL FIELD

This invention relates to a pair of pliers or nippers incorporating multiple axes of rotation and, more particularly, to such nippers specially constructed for use in cutting toenails.

BACKGROUND ART

Plier-type cutters or nippers are well known in the prior art and have been employed for accomplishing a multitude of various functions. Particularly, these cutters or nippers are employed for household and garden use, such as cutting plants, three limbs, branches, stems, and the like, as well as wires, fastening nails, etc. In addition, such cutting pliers or nippers are also utilized by industry for cutting various components employed during manufacturing or production.

Regardless of the purpose for which these prior art cutting pliers or nippers have been employed, the prior art pliers typically incorporate a conventional construction having an elongated arm member incorporating a handle portion and a cutting portion, with both members being movable about an elongated arm member which incorporates a single pivot axis. As a result, movement of the handle portion relative to the pivot axis causes the cutting blades to move towards each other, into cutting engagement with the particular item inserted therebetween. This construction is well known and has been universally employed in conventional cutting pliers and nippers.

Although widely used and universally accepted, these prior art cutting pliers and nippers require substantial force to be exerted on the handle portions in order to provide the desired cutting action at the cutting blades. In particular, when the item inserted between the cutting blades of the prior art pliers or nippers is thick, dense, or formed from a particularly strong or hard material, substantial force must be exerted on the handle members in order to achieve the desired cutting action. As a result, these prior art cutters or nippers have been limited in their useability, and, generally, have been unable to be employed for items which are more difficult to cut.

In addition, individuals having reduced strength in their hands have been incapable of effectively using these prior art cutting pliers or nippers due to the substantial force that must be exerted on the handle to accomplish the cutting of most items. Consequently, either only very small, delicate items are cut or, more likely, these prior art cutting pliers or nippers are not employed at all by individuals who do not have the manual strength to effectuate their use in most applications.

In an attempt to address these problems, some prior art cutting pliers or nippers have been constructed with two pivot axes, in order to attain force compounding. Although these prior art attempts attained some moderate reduction in the force required in cutting certain items, the resulting constructions failed to provide pliers or nippers which satisfied all of the prior art problems. In addition, these prior art attempts were costly and, generally, unreliable due to a tendency to bind or break. Furthermore, these prior art products fail to provide an optimum construction for safety, movement force behavior, and ease of operation and use.

One of the problem encountered with the prior art pliers or nippers is the susceptibility to external contamination and environmental conditions. Generally, these prior art cutting pliers and nippers are constructed with all components thereof completely exposed, thereby allowing all of the components to come into contact with moisture, as well as other external contaminates, such as sand, grease, dirt, and the like. As a result, these prior art cutting pliers and nippers are highly susceptible to damage or breakage due to rust or increased inability to operate properly due to retention of a particular contaminate in the pivot zone, causing the pivot zone to bind or become difficult to operate in a smooth, proper manner.

In addition, these exposed components create a safety hazard, whereby the user's fingers are often injured by being caught in these components during their operation. This hazard often causes fingers to be cut or severely pinched.

In order to provide the desired strength and rigidity required for accommodating the substantial forces that must be employed to use these prior art systems, each of the cooperating components must generally be constructed by forging or expensive production methods requiring subsequent machining such as milling, boring, stamping, and the like. In addition, coatings such as chromium or nickel are also generally required in order to prevent galvanic deposition in connecting points. such as rivets and pivot joints. However, such coatings generally only offer partial rust resistance or protection and, as a consequence, severe residual scale of soluble oil residues or hardening oils are not flushed out and do not provide permanent rust protection. As a result, premature wear and rust formation are generally associated with these prior

art cutting pliers or nippers, causing such prior art systems to become useless.

A further problem found in the prior art is the complete lack of any toe nail nipper incorporating multiple axes of rotation. As a result, no prior art nipper construction exists for use on toenails which enables the user to attain the required cutting force using reduced hand force. This problem is particularly important to older individuals who experience reduced manual dexterity and strength, while also developing thicker toenails. As a result, no prior art product exists to satisfy this need.

Consequently, it is a principal object of the present invention to provide a pair of pliers or nippers which is capable of effectively and efficiently providing force compounding at the cutting edges of the jaws, thereby requiring a reduced force level for attaining a desired cutting force.

Another object of the present invention is to provide cutting pliers or nippers having the characteristic features described above which is easy to use and operate by all individuals, regardless of their manual strength.

Another object of the present invention is to provide cutting pliers or nippers having the characteristic features described above which provides the desired force compounding effect at the cutting blades while being specifically constructed for cutting toenails, thereby enabling older individuals to cut their toenails easily and conveniently.

A further object of the present invention is to provide a pair of cutting pliers or nippers having the characteristic features described above which prevents external contaminates and the user's fingers from contacting the internal operational components thereof, thereby assuring extended life and wear for the cutting pliers or nippers and preventing injury to the user.

Other and more specific objects will in part be obvious and will in part appear hereinafter.

SUMMARY OF THE INVENTION

By employing the present invention, the difficulties and drawbacks of the prior art are eliminated and a pair of pliers or nippers of increased utility is attained. Furthermore, the pliers or nippers of this invention possess great robustness or inherent strength and utility due to the unique multi-rotational axis construction and the force compounding attained thereby.

In particular, the pliers or nipper construction of the present invention has been found to be particularly unique and useful as a toenail nipper, enabling individuals having reduced manual strength to easily and conveniently cut their toenails without requiring assistance from others. The toenail nipper construction of the present invention is of particular importance and utility to individuals with advancing age. As individuals grow older, the toenails become thicker and, consequently, become increasingly more difficult to cut.

In addition, since individuals of advancing age have a tendency to experience a reduction in the strength of their grip or manual dexterity, it becomes increasingly more difficult for older individuals to cut their toenails without requiring assistance from others. By employing the present invention, individuals with reduced hand strength are able to easily and conveniently cut toenails which have increased thickness, due to the force compounding attained by the nipper construction of the present invention and the ability.of the nippers of this invention to produce substantial cutting forces at the cutting edges of the jaws with a smaller force being required on the handles thereof than previously needed. In addition, the handles comprise a universally applicable, palm-engaging shape which enhances their use and adds to the efficacy of the force compounding effect.

In the preferred embodiment of the present invention, the pliers or nippers incorporate a pair of elongated arm members, each of which comprises a handle section and a force transmitting section. In addition, the pair of elongated arm members are mounted to each other for cooperative, pivoting engagement about a common central pivot axis. In the preferred construction, the handle section of each of the elongated arm members extends from the central pivot axis in a generally first direction, while the force transmitting sections of each elongated arm member extend in the opposite direction from the central pivot axis.

In addition, the pliers or nippers of this invention also incorporate a pair of jaw members, each of which comprises a cutting or function-providing edge portion and a movement control portion, which forms a transitional region of the jaw member. Furthermore, at least one elongated bar or fixing plate extends between the two jaw members, with each jaw member being connected to opposed ends thereof by jaw-holding pins or rivets. However, if desired, two elongated bars or fixing plates may be employed.

In the preferred construction, the cutting or function-providing edge portion of each jaw member extends from each of the jaw holding pins or rivets in a first direction, while the movement control portion of each jaw member extends from the jaw-holding pins in the opposite direction. In this way, the jaw members are maintained in juxtaposed, spaced relationship in the precisely desired aligned, cooperating position.

In addition, the fixing plate also incorporates a

cylindrical pin or ball positioned substantially midway therealong, between the jaw members. This pin provides a jaw aligning and pressure receiving or bearing zone for the jaw members, while also establishing a secondary pivot axis for the jaw members. In the preferred embodiment, the cylindrical pin extends substantially perpendicularly from the fixing bar and cooperatively engages both jaw members at their respective junctures of their cutting or function-providing portions and movement control portions.

In addition, the terminating end of the movement control portion of one jaw member is rotationally mounted to the terminating end of the force transmitting section of one of the elongated arm members, while the terminating end of the movement control portion of the second jaw member is rotationally mounted to the terminating end of the force transmitting section of the second elongated arm member. In this way, multi-axes of rotation are attained and the desired compound force generation is realized.

Furthermore, the securing means employed to rotationally interconnect the movement control portion of the jaw member to the force transmitting section of the arm member comprises removable securing means.

In this way, the jaw members are removably mounted to the arm member and easily replaced by any desired alternate jaw member.

Preferably, the jaw members are made from hardened steel, in order to assure that the pliers or nipper construction is inherently strong and rigid for long term extensive use. Furthermore, in order to provide an overall construction which is capable of being manufactured expeditiously and sold at a reasonable price, the handle sections of the elongated arm members are preferably formed from plastic or die casting.

In addition, the handle section preferably comprises a smoothly curved, rounded, eccentric shape which is easily held by the user, both comfortably and efficiently, while force is being applied and throughout its use. This outer surface shape is particularly constructed to provide a universally employable palm-engaging configuration which positions the user's hand for maximum force application, while also being comfortable and natural. By employing this handle configuration, with the overall construction detailed above, the closing forces provided by the user on the handle section act upon the cutting or function-providing portions, producing a force compounding effect on the toenail, or other component being cut, resulting in a cutting action which is easily achieved and uniformly applied.

In the preferred embodiment, the smoothly curved, rounded, eccentric shaped handle section of each elongated arm member establishes the outer surface of each arm member, with the inside surface thereof comprising a substantially elongated, flat surface positioned in juxtaposed, spaced, facing relationship to the inside flat surface of the second handle sections. In addition, handle sections are concentrically mounted to the central pivot axis, to pivot symmetrically therewith about the fixed, hinged pin construction. As a result of this construction, the pliers or nippers of the present invention are constructed so that in the closed position, the cutting edges of the jaw members and the inside, substantially flat surfaces of the handle sections define a substantially straight line, while the hand is still open enough to deliver force.

Furthermore, each elongated arm member incorporates an impact point or pivot limiting abutment stop preferably positioned between the central pivot axis and the handle section, to provide a fixed terminating point for limiting the rotation of the arm members relative to the pivot axis. Preferably, the impact point or stop abutment surfaces also incorporate spring retaining zones formed therein in which a biasing spring is concealed for providing an outwardly biasing force to the handle members, causing said handle members to be biased outwardly, to provide enhanced ease of use and increased utility.

By employing the spring member, the precisely desired opening stroke is attained automatically upon release of the closing forces, thereby enabling the user to merely apply the required closing forces to attain the desired cutting force at the cutting edges of the jaw members.

Furthermore, by employing the spring member in nested interengagement with the elongated arm members, the opening stroke of the pliers or nippers is assured, while no adverse influence on the closing forces required to effectuate the desired cutting action is realized. In the preferred embodiment, a standard helical spring is employed in secure nested engagement in the spring receiving zones formed in each of the elongated arm members, directly adjacent the central pivot axis and the handle sections thereof.

A further advantageous development attained by the present invention is found in providing handles capable of being formed from plastic material, die-cast molding, or composite resin material. In this way, a wide variety of aesthetic designs and configurations are attained and, in conjunction with the force transmission provided by the construction detailed above, a progressive movement behavior is guaranteed. Furthermore, any desired handle strength is inherently attained by proper selection of the handle material.

Another advantage of the present invention is found in the incorporation of a peripherally sur-

rounding shield or adapter and turn-lock safety fastener, preferably formed as a separate component of the nippers. In the present invention, the adapter and the turn-lock safety fastener peripherally encloses, secures and protects all moving internal functional parts of the nipper, completely eliminating the danger that individuals' fingers may become accidentally trapped in the internal components of the nippers. Furthermore, by employing the turn-lock fastener of the present invention, the nippers will not spring open spontaneously if the pliers are dropped or incorrectly operated. Consequently, further use and user safety is attained.

In the preferred construction, any component made from plastic comprises fiber-reinforced material and in the case of components made from die casting, zinc or magnesium is preferably employed.

As a further advantage of the construction of the present invention, the peripherally surrounding shield or adapter is constructed to be removable from the pliers or nippers in order to enable the functional parts thereof to be interchangeable as well as permitting the cleaning and checking of the interior mechanism. This construction further enhances and increases the durability and utility of the present invention.

By providing a removable adapter, a multi-use system is attained in which standardized components can be produced on a modular principle, with a plurality of alternate jaw members being employable for changing from one type of pliers or nipper to an alternate jaw or functional component. In this way, needle nose pliers, universal pliers, side-cutting inserts, etc. can all be constructed from one, single hand-held pair of pliers or nippers.

DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which toenail nippers are illustrated as an exemplary embodiment of the present invention, wherein:

FIGURE 1 is a front elevation view of the pair of pliers of the present invention shown in the closed position;

FIGURE 1A is a rear view of the pliers of FIGURE 1 shown in the closed position;

FIGURE 1B is a left side elevation view of the pliers of FIGURE 1 shown in the closed position;

FIGURE 1C is a bottom end view of the pliers of FIGURE 1 shown in the closed position;

FIGURE 2 is a front view of the pair of pliers/nippers of the present invention depicted in the open position;

FIGURE 2A is a right side elevational view of the removable adapter of the pliers/nippers of the present invention incorporating the turn-lock fastener;

FIGURE 3 is a front view of the pair of pliers/nippers of the present invention shown in the open position with the adapter removed therefrom;

FIGURE 3A is a front view of the adapter employed on the pliers/nippers of the present invention, with the turn-lock fastener removed;

FIGURE 4 is a front plan view, an end view, and a side elevation view of the turn-lock fastener employed in the pliers/nippers of the present invention;

FIGURE 4A are identical views of the turn-lock fastener as shown in FIGURE 4 depicted on a substantially enlarged scale;

FIGURE 5 is a front plan view, partially broken away, and partially in cross-section of the pliers/nippers of the present invention shown in the open position; and

FIGURE 6 is a left side elevation view, partially in cross section and partially broken away, of the pliers/nippers of the present invention shown in the closed position.

DETAILED DESCRIPTION

In the drawings, a pair of cutting pliers or nippers manufactured in accordance with the present invention is shown in detail. Although the cutting pliers or nippers of the present invention may be employed for various cutting purposes, the nippers shown throughout the drawings represent toenail nippers, as an exemplary use of the present invention, as well as a principal unique application of the present invention, in view of the lack of any meaningful prior art. As detailed herein, the cutters or nippers of the present invention establish an easily employable, comfortable, smoothly operable instrument capable of being employed by any individual and, in particular, capable of being easily and comfortably employed by individuals with reduced manual strength.

As best seen in FIGURES 3, 5, and 6, cutting pliers or nippers 100 of the present invention incorporate a pair of elongated arm members 102 and 103. Arm member 102 incorporates a handle section 3 and a force transmitting section 18, while handle member 103 incorporates a handle section 3 and a force transmitting section 18′. In addition, elongated arm members 102 and 103 are securely mounted to each other for cooperative, pivoting

engagement about the axis defined by joint pin A. In the preferred construction, handle section 3 of elongated arm members 102 and 103 extends from the central pivot axis defined by joint pin A in a generally first direction, while the force transmitting sections 18 and 18, of each elongated arm member extend in the opposite direction from joint pin A.

In addition, nippers 100 of the present invention also incorporate a pair of jaw members 105 and 106. Jaw member 105 comprises a cutting or function-providing portion 4 and a movement control portion F, which forms the transitional region of jaw member 105. In addition, jaw member 106 comprises a cutting or function-providing portion 4 and a movement control portion F′, forming the transitional region of jaw member 106. As clearly detailed in the referenced drawings, the cutting or function-providing portions 4,4 of jaw members 105 and 106 extend in a first direction, while movement control portions F and F′ of jaw members 105 and 106 extends in the opposite direction.

Furthermore, the terminating end of movement control portion F of jaw member 105 is pivotally or rotationally mounted to the terminating end of force transmitting section 18 of arm member 102, by pin B. Similarly, the terminating end of movement control portion F′ of jaw member 106 is pivotally or rotationally mounted to the terminating end of force transmitting section 18′ of arm member 103 by pin B′.

In the preferred embodiment, pins B and B′ comprise removable pins, thereby enabling jaw members 105 and 106 to be removed from arm members 102 and 103 whenever desired. As a result, as further detailed below, other jaw member constructions or configurations are quickly and easily mounted to arm members 102 and 103.

In order to secure and maintain jaw members 105 and 106 in the desired juxtaposed, spaced aligned relationship, an elongated bar or fixing plate E interconnects jaw members 105 and 106. Preferably, fixing plate E is mounted at each of its terminating ends to one of the jaw members by jaw holding or joint pins or rivets C and C′. Preferably, at least one fixing plate E is mounted to jaw member 105 by pin C, while the opposed end of fixing plate E is mounted to jaw member 106 by pin C′. In addition, pins C and C′ preferably secure fixing plate E to jaw members 105 and 106 in a manner which allows both rotational and translational movement of jaw members 105 and 106 relative to the axes defined by pins C and C′. As a result of this construction, jaw members 105 and 106 are positioned and securely maintained in juxtaposed spaced aligned relationship, lying in substantially a single plane, with fixing plate E securely interconnecting jaw members 105 and 106 in spaced, aligned planar relationship with each other, while being free to pivot and slide relative to the axis of the holding pins.

In addition, a steel ball or cylindrical pin D is securely retained and supportingly held substantially mid-way along fixing plate E, defining a jaw member aligning and pressure receiving or bearing zone, while also establishing the pivot axis for jaw members 105 and 106. Steel ball or cylindrical pin D establishes the pivot axis for jaw members 105 and 106, while also providing a jaw member aligning and pressure receiving zone for providing the desired alignment and cooperative movement of jaw members 105 and 106 about the pivot axis established thereby. If desired, two fixing plates may be mounted on opposed sides of the jaw members to further assure the maintenance of the desired aligned relationship.

In addition, in order to assure smooth, controlled, cooperative movement of function-providing portions 4,4 in a manner which assures cutting edges SCH are repeatedly and dependably brought into abutting, cutting engagement with each other, jaw members 105 and 106 each comprise an arcuate cut-out portion formed in the inside edge thereof for peripherally surrounding pin D. In this way, jaw members 105 and 106 are securely held in the precisely desired position, and the cooperative movement of function-providing portion 4 of each jaw member is controllably assured.

By employing this construction, a plurality of axes of rotation are established and the desired compound force generation is realized. In addition, the toenail nippers of the present invention are capable of being easily and conveniently employed by individuals with reduced manual strength to cut toenails, regardless of the thickness of the toenails.

As illustrated in the embodiment shown in the drawings, the function-providing portions 4,4 of cutting pliers or nippers 100 incorporate a left-hand or a right-hand cutting blade. Each blade is made up of the cutting-edge region SCH, running centrally from the tip S to the pressure-receiving or thrust bearing zone D, with blade portions adjacent to each other, with both faces thereof lying in substantially the same plane, connected by fixing plate E and anchored using through-pins C and C′. Preferably, the back-edge region of each blade extends in a crescent shape formed along its outer front face as far as movement control portion or transitional region F and F′.

In addition, in order to improve the ease of use of nippers 100, blade members or function-providing portions 4,4 are constructed with a substantially reduced thickness. Preferably, function-providing portions 4,4 are constructed with an overall thickness of about two thirds the thickness of conven-

tional toenail nippers. In this way, the visibility of the area being trimmed or cut is substantially enhanced.

In the preferred embodiment, arm members 102 and 103 are pivotally mounted to each other, using conventional, overlapping, arcuate ring-shaped plates or an interlocking post in combination with a groove hinge pocket formed at the juncture of handle sections 3 and force transmitting sections 18 and 18′. This construction enables force transmitting sections 18, 18′ of arm members 102 and 103 to move away from each other as handle sections 3 are moved towards each other.

In addition, arm members 102 and 103 are preferably constructed from plastic or die-cast material, or a combination of both. Regardless of the material employed, arm members 102 and 103 each comprise a shank section 13 adjacent pivot pin A in handle section 3 which assures that the strength required is provided. Furthermore, handle section 3 of each arm member 102 and 103 is shaped to enable the user to easily attain a full, firm grip of both handle sections, while also being able to easily, comfortably and conveniently operate the handle sections to achieve the desired action at the jaw members.

As best seen in FIGURES 1, 3, and 5, the smoothly curved, round, eccentric shaped handle sections 3,3 of the elongated arm members 102 and 103 establish the outer surface of each arm member, with the inside facing surfaces thereof comprising substantially elongated, flat surfaces positioned in juxtaposed, spaced, facing relationship to each other. As a result of this construction, the substantially flat surfaces of handle sections 3,3 define substantially straight lines.

Furthermore, each elongated arm member incorporates an impact point or pivot limiting stop abutment 9 which is preferably positioned between central pivot axis A and handle section 3, providing a fixed terminating point for limiting the rotation of the arm members about the pivot axis. Preferably, the impact point or stop abutment surface 9 of each arm member also incorporates a spring retaining zone 16/1 formed therein for retainingly supportingly holding biasing spring 16. In this way, handle members 102 and 103 are provided with an outwardly biasing force, causing the handle members to be biased outwardly, when in a closed position, thereby enhancing the ease of use of the present invention.

Preferably, spring member 16 comprises a standard helical spring positioned in secure, nested interengagement within retaining zones 16/1, with retaining zones 16/1 being positioned directly adjacent central pivot axis A and handle sections 3,3.

By employing spring member 16 the precisely desired open stroke position is attained automatically, upon release of the closing force. In this way, the user is merely required to apply the closing force needed to attain the desired cutting force at the cutting edges of the jaw members, without being required to separate the handle member for repeating the cutting process. In addition, by employing spring member 16 positioned in nested inter-engagement in receiving and retaining zones 16/1, the opening stroke of pliers or nippers 100 is assured, and no adverse influence on the closing force required is realized.

As discussed above, the terminating end of each of the force transmitting sections 18 and 18′ is pivotally connected to the terminating end of one of the movement control portions F and F′ by hinge pins B and B′. This construction, in combination with the other pivot axes, achieves the force compounding, toggle-lever function attained by nippers 100 of this invention. The central connection of this concentric arrangement is provided by the principal joint pin A with its hinge-like design (18″ in FIGURE 5), resulting in a fixed association between the shank sections 13,13 of handle portions 3,3 of arm members 102 and 103, and function providing portions 4,4 of jaw members 105 and 106.

When handle sections 3,3 are in the opened position, the movement control portions or transitional region F and F′ are substantially flat and extend from their respective pivot axis B and B′ substantially parallel to each other toward the tip S. In the opposite position, the pressure applied position, with handle sections closed, the transitional regions are splayed open and point at an acute angle to the straight line Y, FIGURE 2. Furthermore, a cover or adapter 1 is constructed to assure that this inner splaying does not impair the cutting procedure, by spacing the inside adjacent surfaces of adapter 1 with sufficient breadth to assure that no contact or interference occurs between adapter 1 and movement control portions F and F′.

As shown throughout the drawings, cutting pliers or nippers 100 of the present invention incorporate a protective cover or adapter 1 which peripherally surrounds and shields the multiple pivot axes of nipper 100. In this way, the difficulties encountered by prior art nippers from environmental contamination is completely eliminated.

Preferably, cover or adapter 1 is manufactured from comparatively inexpensive material, such as plastic or die-cast metals in order to provide a safe, protective shield or cover which peripherally surrounds and encloses the multiple pivot axes of the nipper of the present invention, while being lightweight and comparatively inexpensive to produce. In addition, in order to assure that adapter 1 is easily and quickly mountable in the precisely desired position, adapter 1 incorporates a raised boss

or pin 19 formed on an inside wall thereof, as depicted in FIGURES 1A and 6. Preferably, Pin 19 cooperatively engages with fixing plate E, to assure repeatability and consistency in securely positioning adapter 1 in the precisely desired location.

In order to enhance the safety of nippers 100 of the present invention, a turn-lock fastener 2 is mountable in adapter 1 for cooperative locking interengagement of handles 3 of arm members 102 and 103 in the closed position. Turn-lock fastener 2 incorporates a radially extending or projecting stop lip 2/2 on the bottom portion thereof which securely, lockingly interengages about the turn-lock fastener bearing surface 22 of adapter 1.

In the preferred embodiment, projecting stop lip 2/2 is securely retained within overlapping flange 5 of adapter 1 in order to maintain turn-lock fastener 2 in rotating interengagement about bearing surface 22. In this way, the desired 90° rotation of turn-lock fastener 2 is assured, and the secure, fixed, locking interengagement of arm members 102 and 103 in the closed position is provided.

Handle section 3 of arm member 102 incorporates an upstanding pin or projection 17 located below central axis A, while handle section 3 of arm member 103 similarly comprises an upstanding pin or projection 17′ positioned below central pivot axis A. As best seen in FIGURE 3, upstanding projection 17 and 17′ of arm members 102 and 103 are preferably positioned between central pivot axis A and spring receiving recesses 16/1.

Turn-lock fastener 2 incorporates an elongated groove 2/3 formed on the bottom surface thereof which is positioned for cooperative engagement and disengagement with upstanding projection pins 17 and 17′. When in the open position, pins 17 and 17′ are free to move within elongated groove 2/3 of turn-lock fastener 2. However, when turn-lock fastener 2 has been rotated 900, while handles 3 of arm members 102 and 103 are in the closed position, groove 2/3 of turn-lock fastener 2 peripherally surrounds and lockingly holds upstanding projections 17 and 17″, preventing handles 3 from moving outwardly from each other due to the spring forces of spring means 16. In this way, arm members 102 and 103 are securely, lockingly held in the closed configuration, assuring both safety and positive locked retention in this position.

In addition, turn-lock fastener 2 also incorporates flute-like formations 6 formed on an outside surface thereof as a radially extending, outwardly projecting contact zone on face 8 of adapter 1, providing a readily accessible, easily employable surface by which turn-lock fastener 2 can be rotated between its two alternate positions. In addition, a stop projection 7 is formed on face 8 of adapter 1, providing a positive stop for turn-lock fastener 2, preventing turn-lock fastener 2 from being unintentionally rotated during use and causing an interruption in the cutting procedure. In the preferred embodiment, stop projection 7 is constructed to engage within arcuate slot 2/4 of turn-lock fastener 2 when turn-lock fastener 2 has been rotated into the open position. In this way, a positive, securely fixed position for turn-lock fastener 2 is attained, when in the open position, thereby preventing its accidental rotation into the closed position.

In the preferred construction of function providing portions 4,4 of jaw members 105 and 106 as toenail cutting blades, jaw members 105 and 106 are preferably prefabricated by known techniques, in order to obtain a secure, reliable, trouble-free jaw member. Preferably, in addition to jaw members 105 and 106 being stamped and swaged, both jaw members 105 and 106 comprise stainless steel and are preferably hardened and ground to obtain the desired reliable and dependable cutting action. In addition, jaw members 105 and 106 are independently rotationally and translationally mounted to fixing plate E, while being mounted for pivotal movement about pivot-axis defining bearing surface D positioned therebetween.

As discussed above, jaw members 105 and 106 are mounted to plate E for both rotation and translation about their respective holding pins. In addition, this construction assures that jaw members 105 and 106 are mounted to fixing plate E in a manner which assures jaw members 105 and 106 are incapable of twisting relative thereto, thereby assuring that the desired planar orientation of jaw members 105 and 106 is maintained.

In the preferred construction, the outer edges of function providing portions 4,4 of jaw members 105 and 106 incorporate swaged zones 21″ and 21. As best seen in FIGURE 5, swaged zones 21″ and 21 are formed on the outside edge of jaw members 105 and 106 in position for abutting contacting engagement with the upper edge of adapter 1.

Furthermore, in the preferred construction, blade facet 12 of each function providing portion 4 is offset from the cutting edge SCH and swaged obliquely at a precisely desired cutting angle shown in FIGURE 2 as X^2-X. This cutting angle is specifically designed to correspond to the travel distance of handle sections 3,3 of arm members 102 and 103 shown in FIGURE 2 as X^1-X. In this way, the precisely desired relationship between these two angles is obtained, with the travel distance of handle sections 3,3 of arm members 102 and 103 being X^1-X, while the corresponding cutting angle or travel distance between cutting edges SCH of jaw members 105 and 106 is X^2-X. By employing this construction, optimum cutting potential is realized and repeatable, accurate, trouble-free operation of nippers 100 is attained.

Pliers With Transmission and Safety Fastener

The invention relates to a pair of pliers having in the working region steel inserts such as, for examples FIGURE 1 (4), cutting inserts and handles 3 of plastic or die-cast metal, receiving and transmission elements FIGURE 3 (18 and 18′) connected to the aforementioned and an adapter 1 with safety fastener 2, the adapter extending overlapping on all sides from the region of the inserts (cutting edges 4) via the transitional region FIGURE 3 F, the transmission region B and B′, spring region 16 as far as the centering region A, thus securing and protecting the entire movable internal mechanism, consequently the functional inserts freely movable in the insertion region 4, e.g. FIGURE 1 stop cutting blades of steel, arranged adjacently, resting on flat and so as to hinge symmetrically and positioned and fittingly anchored on the left-hand and right-hand side by a fixing plate FIGURE 3 E by means of the joint pins C and C′ reaching through, and held (freely movably) centrally in the inner leading flank D (pressure zone) by a steel ball or a cylindrical pin. The adapter checks this embedding region and all hinge-steel, plastic or die-cast connecting pins by its inner faces, running on flat, in the mechanism region. The projecting stop in 19 stops and locks the adapter at the inner flank of the fixing plate and thus also guarantees the optimum mechanical sequence of motions as far as the turn-lock fastener bearing 22. In order to optimize the design and production, the symmetrical steel cutting-edge region 4, which lies on flat and is not offset, and the steel transitional region FIGURE 3 F and F′ extend in a receiving and transmission region 18 and 18′ sheathed in plastic or die-cast zinc and having a supported central pivot FIGURE 3 A, in which the principal joint pin 18″, shaped like a hinge, fits at the inside of the receiving zone 18 and 18, and is locked by a cylindrical pin A. On both sides of the joint limb inner flank 18 and 18′, two crescent-shaped projections 17 and 17′ protruding on the face side form the fastener stop for the elongate groove FIGURE 4A (2/3), which is situated on the underside of the fastener body 1 and, by leftward rotary movement through 90°, compensates the eccentric movement of the handle zone 13 relative to the receiving zone 22, said movement proceeding non-proportionally synchronously, and for this purpose secures, by anchoring and engaging over, the stop position of the arcuate handles 3 in the spacing region 9.

Replaceable Jaw Members

In the preferred embodiment, jaw members 105 and 106 are pivotally mounted to arm members 102 and 103 by pins B and B′ in a manner which enables jaw members 105 and 106 to be removed from their respective pivotally engaged positions. In this way, alternate jaw members are easily mounted to the same arm members for being pivotally interconnected with arm member 102 and 103 in substantially the identical position. In this way, pliers or nippers 100 of the present invention can be quickly and easily converted for use with other function providing portions formed on the jaw members. Consequently, a plurality of jaw members with function providing portions such as clamps, needle nose pliers, side-cutting inserts, etc. can be employed with the same advantageous force compounding effects, while employing the same arm members 102 and 103.

In the preferred embodiment, alternate jaw member constructions are provided in fixed sets, with fixing plate E securely interconnecting the jaw members in the desired spaced, aligned, relationship. In addition, jaw member aligning and pressure receiving and pivot axis establishing pin D is positioned between the jaw members to assure the smooth, continuous, trouble-free operation thereof when mounted to arm members 102 and 103. In addition, in order to enable jaw members 102 and 103 to be easily removed and replaced, pins B and B′ are preferably constructed as removable pin assemblies, thereby providing the desired jaw member removability easily and conveniently.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above article, without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Claims

1. A pair of pliers/nippers constructed for providing optimum force at the operative end with a minimum input force, said pliers/nippers comprising

A. a pair of arm members pivotally interconnected to each other, with each arm member incorporating a. an ergonamically designed handle section ex-

tending from the pivot axis in a first direction, and
b. a force transmitting section extending from said pivot axis in a second direction;
B. a pair of jaw members, each comprising
a. a function providing portion extending in a first direction and establishing the operative end of the pliers or nippers, and
b. a movement control portion extending from said function providing portion in a second direction;
C. first and second interconnecting means, said first interconnecting means pivotally securing one of said jaw members to one of said arm members and said second interconnecting means pivotally securing the second jaw member to the second arm member; and
D. at least one fixing plate positioned in cooperative, engagement with both jaw members for maintaining the jaw members in juxtaposed, spaced, aligned, cooperating relationship, said fixing plate being
a. mounted at one end thereof to a first one of said jaw members, and
b. mounted at its opposed end to the second jaw member, and
E. means positioned between the jaw members for providing a pivot axis about which said jaw members move to attain the desired cooperating engagement of the function providing portions,
whereby a plurality of separate and independent pivot axes are established which enable a force compounding effect to be realized, allowing the user to impart a minimum force to the handle section with an optimum force being realized at the function providing portions of the jaw members.

2. The pliers/nippers defined in Claim 1 wherein each of the interconnecting means is further defined as being removable and positioned for pivotally interconnecting one terminating end of a force transmitting section to one terminating end of a movement control portion.

3. The pliers/nippers defined in Claim 2, wherein the force transmitting section of each arm member is further defined as being angularly disposed relative to the handle section substantially about the pivot axis and comprising an overall length substantially less than the length of the handle section, such that movement of the handle section in a first direction about the pivot axis causes movement of the force transmitting section in the substantially opposite direction about the pivot axis with a substantially increased force level.

4. The pliers/nippers defined in Claim 3, wherein the force level of the force transmitting section is transferred substantially in its entirety to the movement control portion, causing said movement control portion to cause the pivotal movement of the jaw members about their pivot axis and the operation of the function-providing portion thereof.

5. The pliers/nippers defined in Claim 4, further comprising
E. a jaw member aligning and pressure receiving pin mounted to the fixing plate and extending therefrom into abutting relationship between adjacent surfaces of said jaw members for maintaining said jaw members in juxtaposed spaced aligned relationship and forming the pivot axis means for the jaw members while also providing a pressure receiving surface for cooperating with the pivotal movement of said jaw members about the axis thereof.

6. The pliers/nippers defined in Claim 5, wherein the fixing plate is further defined as being mounted substantially mid-way along the length of the jaw members.

7. The pliers/nippers defined in Claim 6, wherein said function providing portion of said jaw members is further defined as comprising toenail cutting edges.

8. The pliers/nippers defined in Claim 7, wherein said function providing portion is further defined as comprising a minimum overall thickness, in order to enhance the useability thereof and the visibility of the toenails being cut, while not compromising or increasing fracturability.

9. The pliers/nippers defined in Claim 6, wherein said arm members are further defined as being formed from plastic or die-cast material, while said jaw members are further defined as being formed from hardened steel.

10. The pliers/nippers defined in Claim 6, wherein said jaw members are further defined as being maintained in aligned relationship with the movement control portions thereof aligned in substantially the same plane.

11. The pliers/nippers defined in Claim 1, wherein said interconnecting means are further defined as being removable, thereby enabling alternate jaw members to be mounted to said arm members.

12. The pliers/nippers defined in Claim 1, and further comprising
F. a protective cover removably mounted to the pliers/nippers for peripherally surrounding and enclosing the plurality of pivot axes thereof, thereby shielding and protecting said pivot axes from environmental contamination and providing a positive protection from safety hazards.

13. The pliers/cutters defined in Claim 12, wherein said arm members are further defined as being movable about their pivot axis between a jaw open position and a jaw closed position and said nippers/pliers further comprising
G. lock means cooperatively engageable with the arm members for securing the arm members in the jaw closed position.

14. The pliers/nippers defined in Claim 12,

wherein each of said arm members is further defined as comprising an upstanding pin for cooperative engagement with the lock means to assure secure, locked engagement of the arm members in the closed position, and the lock means is further defined as being rotationally mounted in the adapter for aligned, cooperative, locking engagement with the pins of the arm members.

15. The pliers/nippers defined in Claim 14, wherein said lock means is further defined as comprising a ridged surface for each of use in rotating the lock means between the locked and unlocked positions.

16. The pliers/nippers defined in Claim 1, wherein said arm member further comprises spring receiving zones formed therein positioned in juxtaposed spaced relationship to each other, and said pliers/nippers further comprises spring means mounted in said receiving zones of said arm members for biasing said arm members outwardly from the closed position to their open position.

17. Pliers/nippers comprising a working region having steel inserts such as cutting inserts, handles (3), receiving and transmission elements (18 and 18′) intermediate the inserts and the handles, an adapter (1) with safety fastener (2). the adapter overlapping a transitional region of the inserts (f), a transmission region (B and B′) between the transmission elements and the inserts, a spring region (16), and a central pivot (A), thereby securing and protecting the entire functional mechanism whilst allowing the insert to be free moveable so as to hinge symmetrical]y and relative to a fixing plate (E) to which the inserts are anchored on the left-hand and right-hand side by means of the joint pins (C and C′) and by means of a central freely movably pivot (D). the fastener (2) including a fastener bearing (22), a projecting stop pin (19) for stopping and locking the adapter at the fixing plate and allowing optimum mechanical sequence of motions as far as the fastener bearing (22), the steel inserts having symmetrical cutting-edge regions (4) aligned so as to lie on the flat and not offset, and the central pivot (A) having a principal joint pin (18″), shaped like a hinge, which fits at the inside of the receiving and transmission elements (18 and 18′) and which is locked by a cylindrical pins two crescent-shaped projections (17 and 17′) which cooperate with an elongate groove (2/3), situated on the underside of the fastener body and which forms stops for the fastener, whereby rotary movement through 90 degrees, compensates the eccentric movement of a handle zone (13) of the handles relative to a receiving zone of the receiving and transmission elements (18 and 18′), said movement proceeding non-proportionally synchronously.

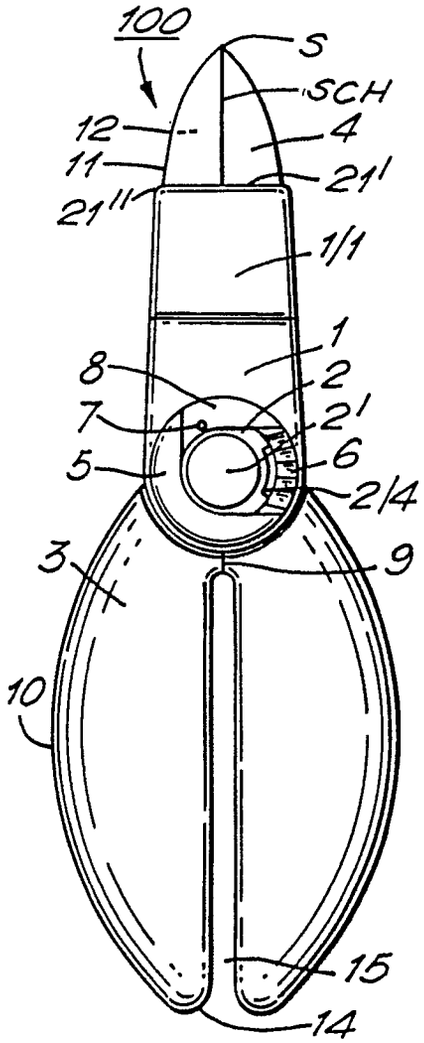


FIG.1.

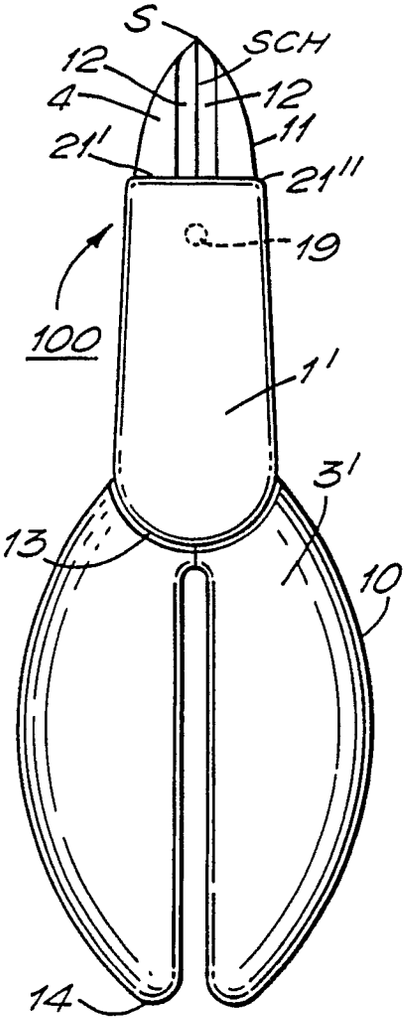


FIG.1a.

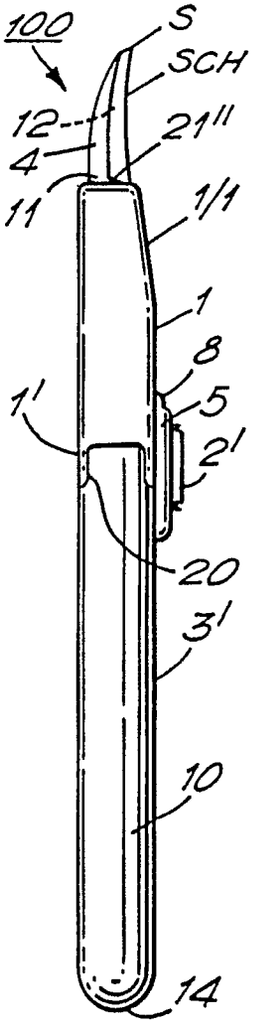


FIG.1b.

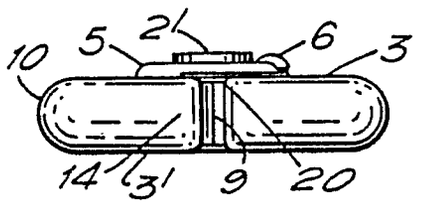


FIG.1c.

FIG.3a.

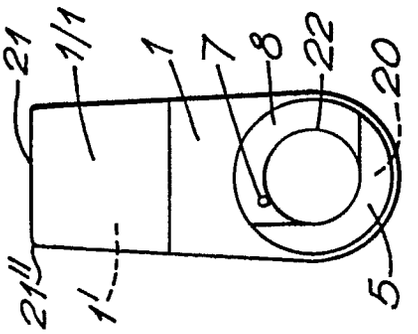


FIG.4.

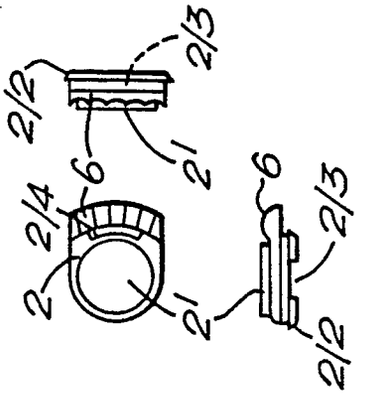


FIG.3.

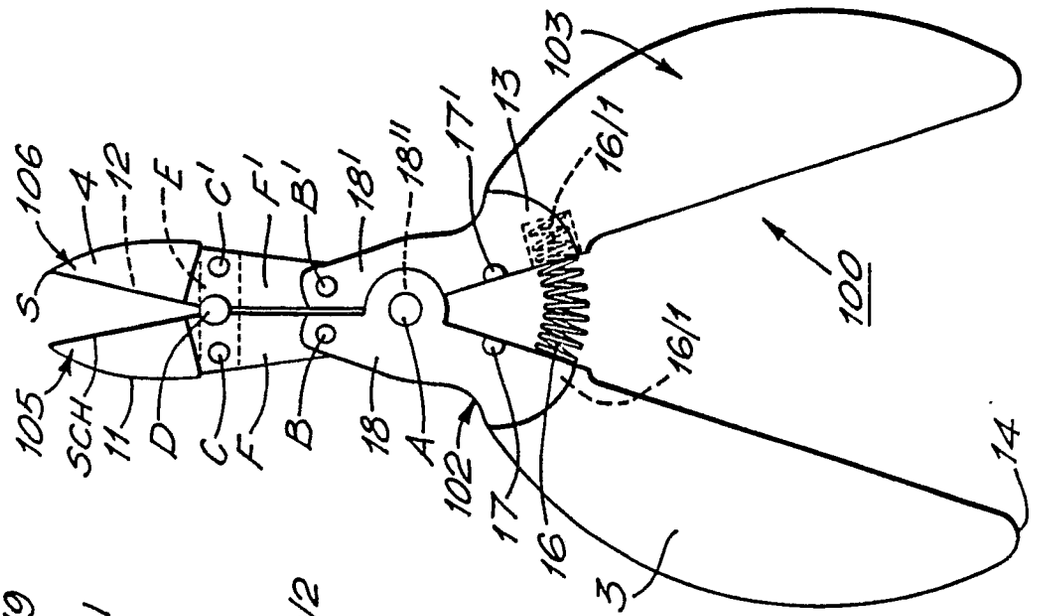


FIG.2a.

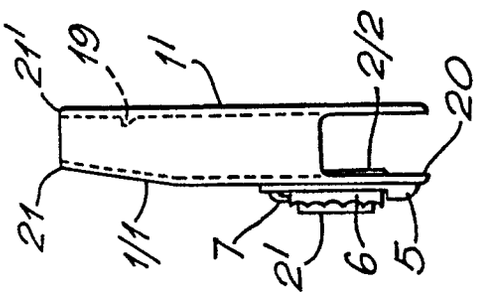
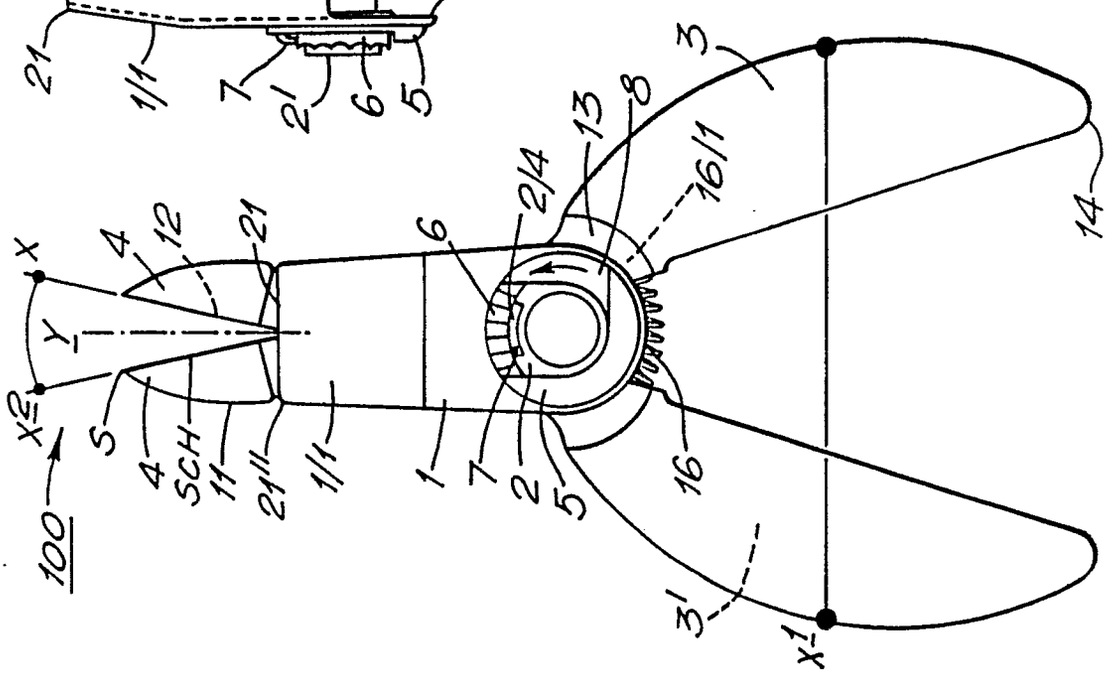


FIG.2.



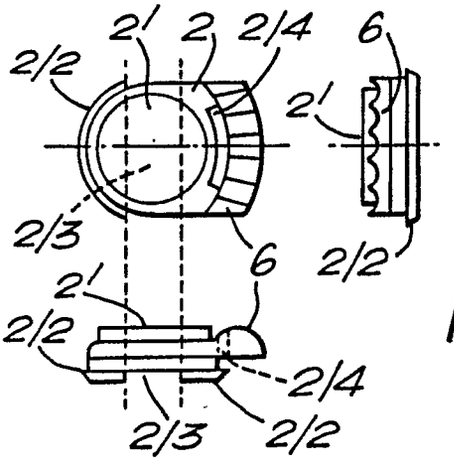


FIG.4a.

FIG.5.

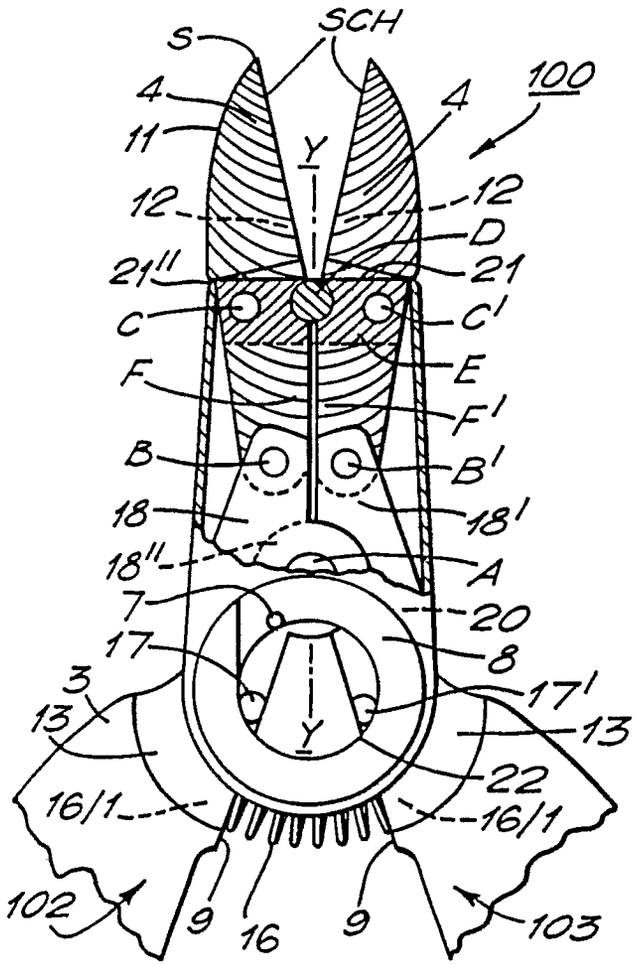


FIG.6.